

#### Product Summary

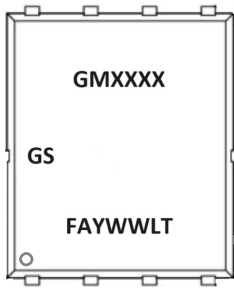
| $V_{DS}$ (V) | $R_{DS(on),max}$ (mΩ) | $I_D$ (A) |
|--------------|-----------------------|-----------|
| -30          | 20@ $V_{GS} = -4.5V$  | -32       |

#### Features

- ❖ Fast Switching
- ❖ Low On-Resistance
- ❖ Low Gate Charge

#### Application

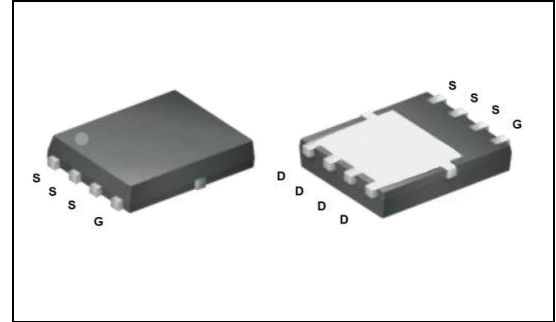
- ❖ Load Switch
- ❖ Battery protection
- ❖ Uninterruptible power supply



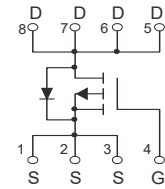
PDFN3333

NOTE:  
 LOGO - GS  
 GMXXXX- Part number code  
 F - Fab location code  
 A - Assembly location code  
 Y - Year code  
 WW - Week code  
 L&T - Assembly lot code

PDFN3333



Equivalent circuit



#### Absolute Maximum Rating ( $T_a=25^\circ C$ )

| Parameter                                                  |                  | Symbol         | Limit      | Unit       |
|------------------------------------------------------------|------------------|----------------|------------|------------|
| Drain-source voltage                                       |                  | $V_{DS}$       | -30        | V          |
| Gate-source voltage                                        |                  | $V_{GS}$       | $\pm 20$   |            |
| Continuous drain current ( $V_{GS}=-4.5V$ ) <sup>(1)</sup> | $T_C=25^\circ C$ | $I_D$          | -32        | A          |
|                                                            | $T_C=70^\circ C$ |                | -20        |            |
| Pulsed drain current <sup>(2)</sup>                        |                  | $I_{D,pulse}$  | -96        |            |
| Power dissipation                                          | $T_C=25^\circ C$ | $P_D$          | 36.5       | W          |
|                                                            | $T_A=25^\circ C$ |                | 1.9        | W          |
| Operating junction and storage temperature range           |                  | $T_J, T_{stg}$ | -55 to 150 | $^\circ C$ |

#### Thermal Characteristic

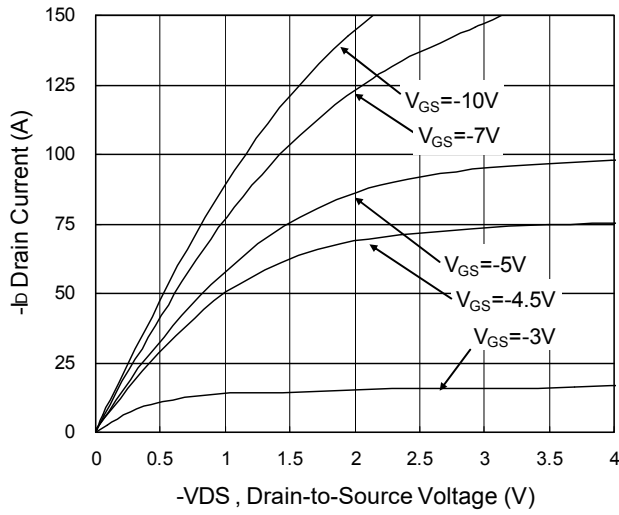
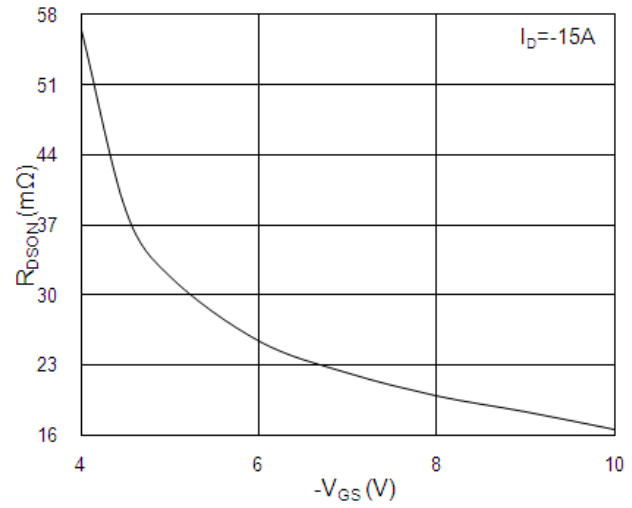
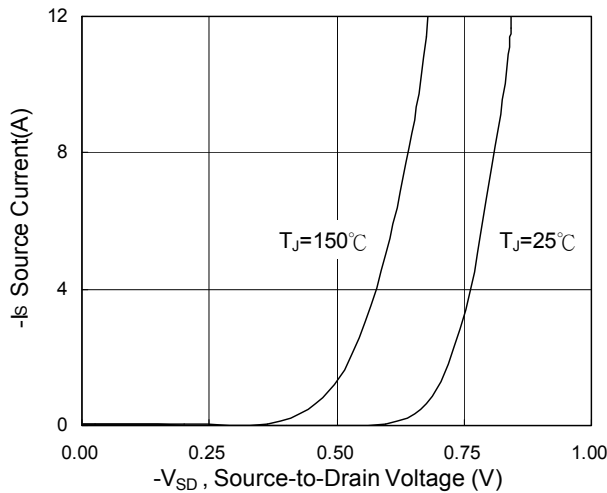
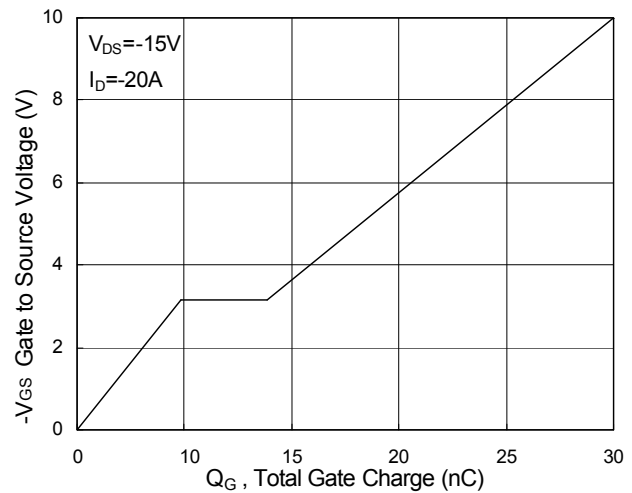
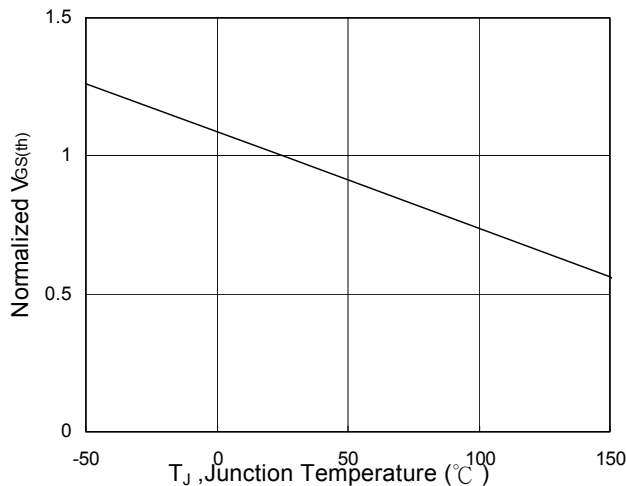
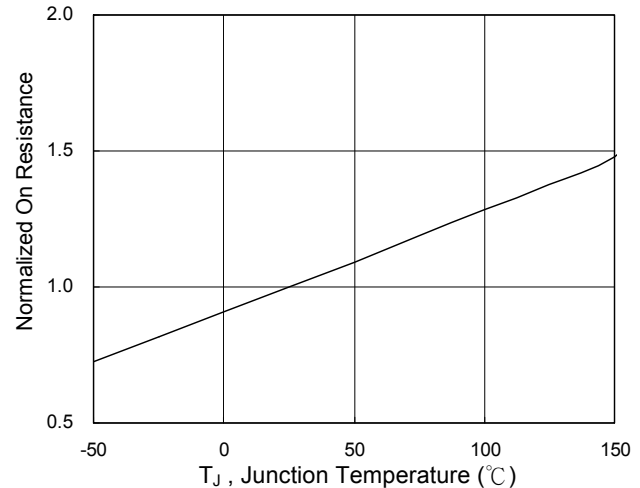
| Parameter                                              |              | Symbol          | Max. | Unit         |
|--------------------------------------------------------|--------------|-----------------|------|--------------|
| Thermal resistance, junction-to-case                   | Steady state | $R_{\theta JC}$ | 3.4  | $^\circ C/W$ |
| Thermal resistance, junction-to-ambient <sup>(4)</sup> | Steady state | $R_{\theta JA}$ | 60   |              |

**Electrical characteristics (Ta=25°C ± 3°C)**

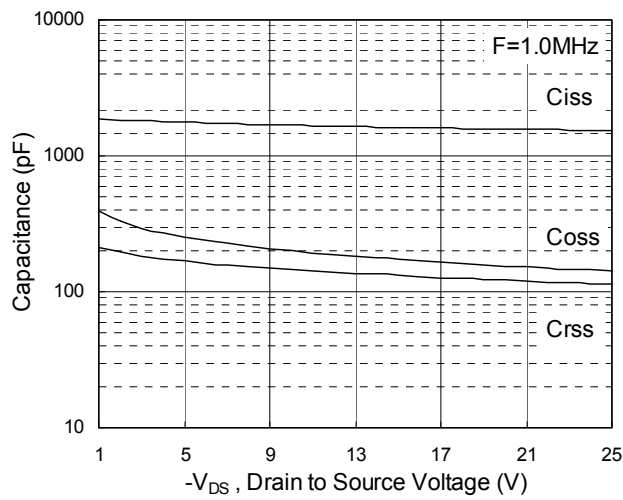
| Parameter                                    | Symbol               | Test conditions                                                                                  | Min. | Typ. | Max. | Unit |
|----------------------------------------------|----------------------|--------------------------------------------------------------------------------------------------|------|------|------|------|
| Static parameter <sup>(4)</sup>              |                      |                                                                                                  |      |      |      |      |
| Drain to source breakdown voltage            | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA                                                  | -30  |      |      | V    |
| Gate-source threshold voltage                | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA                                     | -1.1 | -1.6 | -2.2 | V    |
| Gate-body leakage                            | I <sub>GSS</sub>     | V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V                                                   |      |      | ±100 | nA   |
| Zero gate voltage drain current              | I <sub>DSS</sub>     | V <sub>DS</sub> = -24 V, V <sub>GS</sub> = 0 V                                                   |      |      | -1   | μA   |
| Drain-source on-resistance                   | R <sub>DS(on)</sub>  | V <sub>GS</sub> = -10V, I <sub>D</sub> = -10 A                                                   |      | 15   | 15   | mΩ   |
|                                              |                      | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -6 A                                                   |      | 23.5 | 29.5 | mΩ   |
| Forward transconductance                     | g <sub>fs</sub>      | V <sub>DS</sub> = -5.0V, I <sub>D</sub> = -30 A                                                  |      | 15   |      | S    |
| Gate resistance                              | R <sub>g</sub>       | V <sub>GS</sub> = 0V, V <sub>DS</sub> = 0V, f = 1MHz                                             |      | 9    |      | Ω    |
| Dynamic <sup>(5)</sup>                       |                      |                                                                                                  |      |      |      |      |
| Total gate charge                            | Q <sub>g</sub>       | V <sub>DS</sub> = -15V, I <sub>D</sub> = -20A<br>V <sub>GS</sub> = -10V                          |      | 29   |      | nC   |
| Gate-source charge                           | Q <sub>gs</sub>      |                                                                                                  |      | 3.0  |      |      |
| Gate-drain charge                            | Q <sub>gd</sub>      |                                                                                                  |      | 4.9  |      |      |
| Turn-on delay time                           | t <sub>d(on)</sub>   | V <sub>GS</sub> = -10V, V <sub>DS</sub> = -15V<br>I <sub>D</sub> = -15 A, R <sub>G</sub> = 2.7 Ω |      | 5.8  |      | ns   |
| Rise time                                    | t <sub>r</sub>       |                                                                                                  |      | 39   |      |      |
| Turn-off delay time                          | t <sub>d(off)</sub>  |                                                                                                  |      | 49   |      |      |
| Fall time                                    | t <sub>f</sub>       |                                                                                                  |      | 28   |      |      |
| Input capacitance                            | C <sub>iss</sub>     | V <sub>DS</sub> = -15 V, V <sub>GS</sub> = 0 V, f = 1 MHz                                        |      | 1365 |      | pF   |
| Output capacitance                           | C <sub>oss</sub>     |                                                                                                  |      | 172  |      |      |
| Reverse transfer capacitance                 | C <sub>rss</sub>     |                                                                                                  |      | 144  |      |      |
| Reverse Diode Characteristics <sup>(5)</sup> |                      |                                                                                                  |      |      |      |      |
| Diode forward voltage                        | V <sub>SD</sub>      | V <sub>GS</sub> = 0 V, I <sub>F</sub> = -1 A                                                     |      | 0.8  | 1.1  | V    |
| Reverse recovery time                        | t <sub>rr</sub>      | I <sub>F</sub> = -20 A, di/dt = 100 A/μs                                                         |      | 14   |      | ns   |
| Reverse recovery charge                      | Q <sub>rr</sub>      |                                                                                                  |      | 6.2  |      | nC   |

**Notes**

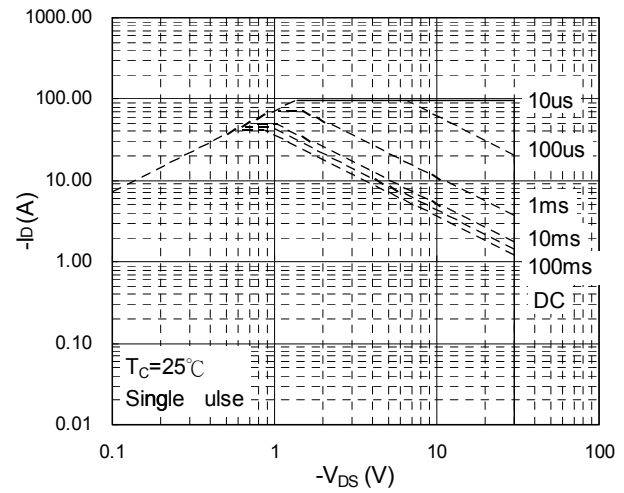
1. This current is chip limited, which is calculated based on  $R_{thjc}$ .
2. This current is calculated on single pulse with 10μs Pulse & Duty Cycle = 1%.
3. Device mounted on FR-4 substrate PC board with 2oz copper in 1inch square cooling area.
4. Short duration pulse test used to minimize self-heating effect.
5. Defined by design, not subject to production.

**Electrical characteristics diagrams**

**Fig.1 Typical Output Characteristics**

**Fig.2 On-Resistance vs. G-S Voltage**

**Fig.3 Forward Characteristics of Reverse**

**Fig.4 Gate-Charge Characteristics**

**Fig.5 Normalized VGS(th) vs. TJ**

**Fig.6 Normalized RDS(on) vs. TJ**

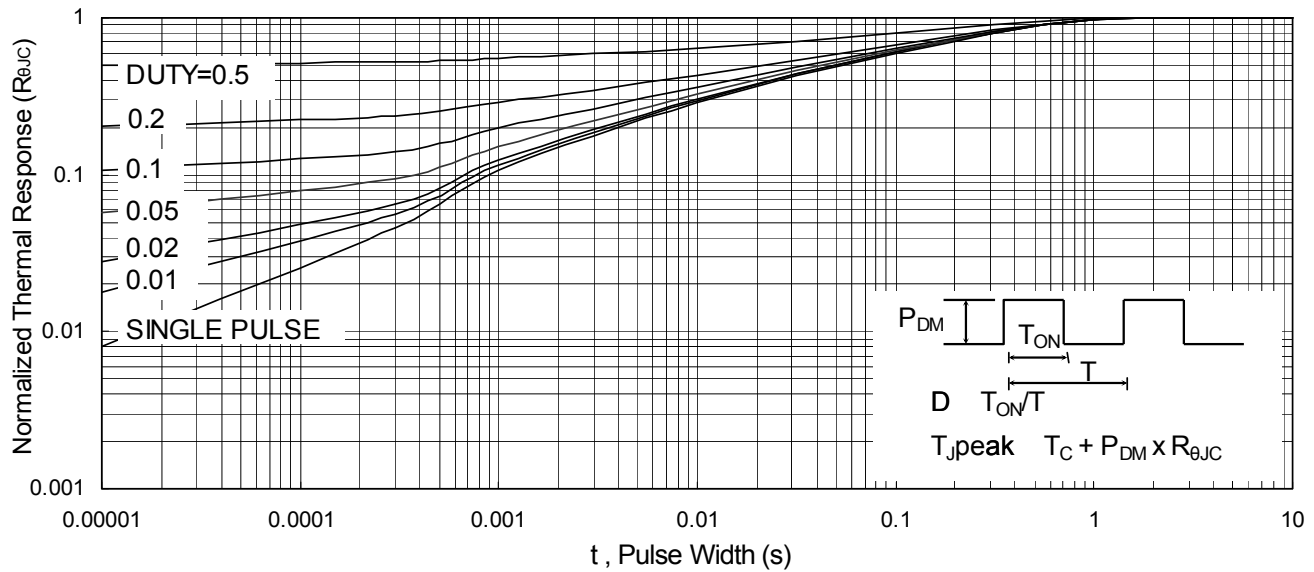
## Electrical characteristics diagrams



**Fig.7 Capacitance**

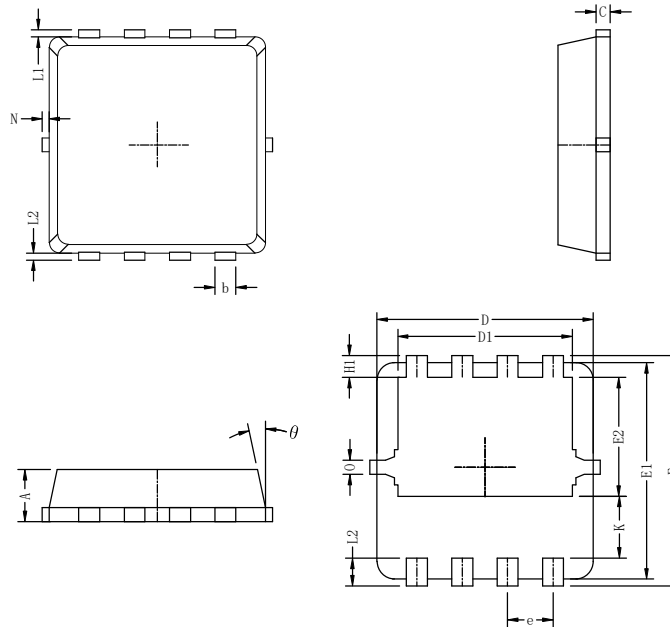


**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**

Package outline dimensions PDFN3333



| Symbols | Millimeters |      |      |
|---------|-------------|------|------|
|         | MIN.        | NOM. | MAX. |
| A       | 0.65        | 0.75 | 0.85 |
| b       | 0.25        | 0.30 | 0.35 |
| C       | 0.15        | 0.20 | 0.25 |
| D       | 3.00        | 3.10 | 3.20 |
| D1      | 2.40        | 2.50 | 2.60 |
| E       | 3.20        | 3.30 | 3.40 |
| E1      | 3.00        | 3.10 | 3.20 |
| E2      | 1.60        | 1.70 | 1.80 |
| e       | 0.65 BSC.   |      |      |
| H1      | 0.21        | 0.31 | 0.41 |
| H2      | 0.30        | 0.40 | 0.50 |
| K       | 0.78        | 0.88 | 0.98 |
| L1/L2   | 0.10 REF.   |      |      |
| θ       | 11°         | 12°  | 13°  |
| N       | 0           | -    | 0.15 |
| 0       | 0.2 REF.    |      |      |

## **Important Notice**

The information given in this document shall be for illustrative purposes only and shall in no event be regarded as a guarantee of conditions or characteristics. Gostone reserves the right to change any information herein. With respect to any examples, hints or any typical values stated herein and/or any information regarding the application of the product, Gostone or its affiliates hereby make no representation or warranty of any kind, expressed or implied, as to any information provided hereunder, including without limitation as to the accuracy, completeness or non-infringement of intellectual property rights of any third party, and they assume no liability for the consequences of use of such information. In addition, any information given in this document is subject to customer's compliance with its obligations stated herein and any applicable legal requirements, norms and standards concerning customer's products and any use of the product of Gostone in customer's applications. The information contained herein is exclusively intended for technically trained staff. No license is granted by implication under any patent right, copyright, mask work right, or other intellectual property right. It is customer's sole responsibility to evaluate the suitability of the product for the intended application and the completeness of the product information given herein with respect to such application. In no event shall Gostone or its affiliates be liable to any party for any direct, indirect, special, punitive, incidental or consequential damages of any nature whatsoever, including but not limited to loss of profits and loss of goodwill, whether or not such damages are based on tort or negligence, warranty, breach of contract or any other legal theory. In addition, any recipient of this document and the relevant products samples may not alter, decompile, disassemble, reverse engineer, or otherwise modify any information/samples received hereunder. Any intellectual property rights arising from the reverse engineering of Gostone's products shall belong to Gostone.